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Doping Dependence of the Giant Spontaneous Hall Effect in $La_{1-x}Ca_xCoO_3$ ($0.1 \leq x \leq 0.5$) A. V. SAMOILOV, G. BEACH, C.C. FU, N.-C. YEH, Department of Physics, # 114-36, California Institute of Technology, Pasadena, CA 9112.5, R. P. VASQUEZ, Center for Space Microelectronic '1'ethnology, JPL, California Institute of l'ethnology, Pasadena, CA 9] 109[1]We report a very large spontaneous Hall effect in ferromagnetic $La_{1-x}Ca_xCoO_3$ epitaxial films and ceramics. The spontaneous Hall effect is strongest for $x=0.2$, which is a doping level close to the magnetic percolation threshold in $La_{1-x}Ca_xCoO_3$. Except near the magnetic percolation threshold, the longitudinal] resistivity of $La_{1-x}Ca_xCoO_3$ decreases with increasing field. Peculiar temperature-dependent magnetoresistance occurs in the sample with $x=0.2$. The normal Hall coefficient R_0 is much smaller than the spontaneous Hall coefficient. We estimate a lower limit for the carrier density $n = 1/(\text{Roe}) > 3\times 10^{28}\text{m}^{-3}$. The low-f-field slope of the Hall resistivity reaches a maximum value $\rho_{xy}/(\mu_0 H) \approx 2\times 10^{-6}\,\text{m}^3/\text{C} = 200\ \mu\Omega\text{cm/T}$ for $x=0.2$ below the Curie temperature. The large magnitude of $\rho_{xy}/(\mu_0 H)$ may be used for sensitive low-field magnetometers. We suggest that the coexistence of high- and low-spin configurations in the perovskite cobaltites, which gives rise to the magnetic percolation behavior, may be responsible for the giant Hall effect.

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